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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

TH

Office Action Summary	Application No.	Applicant(s)	
	08/520,079	YAMAZAKI ET AL.	
	Examiner	Art Unit	
	Matthew C. Landau	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *73-116,123-141 and 143-155* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-116,123-141 and 143-155* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 73-116, 123-141, and 143-155 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. (US Pat. 5,563,426, hereinafter Zhang).

The applied reference appears to have a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

With regard to claim 73, Zhang discloses in figure 4c a thin film transistor. Zhang discloses in figures la- lc, 2a -2d, and 4a- 4c a crystalline semiconductor island (3) over a substrate (la) having an insulating surface (lb). Zhang discloses in figures 4b and 4c source (25a and 25c) and drain regions (25b and 25d) in said semiconductor island. Zhang discloses in figure 4b a channel forming region (between 25a and 25b in figure 4b) between said source and drain regions. Zhang discloses in figures 4a - 4c a gate insulating film (22) adjacent to at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode (23a) adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary (4). No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore, Zhang must teach in figures la - lc, 2a - 2d and 4a - 4c wherein said semiconductor island includes a spin density not higher than 1×10^{17} cm^{-3}, because an identical spin density is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column11, lines 47 -56 wherein said crystalline semiconductor island includes hydrogen at concentration less than 1×10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not greater than 1×10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not greater than 1×10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap, Further, any changes in particular device concentrations or properties would have been routine experimentation for one of, ordinary

skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^3 or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claim 74, Zhang discloses in figures la, lb, and 2a; and column 6,. lines 19 - 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 75, Zhang discloses in figures la, lb, and 2a; and column 6, lines 19 - 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5×10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not greater than 5×10^{19} cm^{-3}. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the

prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claim 76, Zhang discloses in column 9, lines 38 - 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches wherein said semiconductor island includes a point defect of 1 x 10^{16} cm^{-3} or more. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to have said semiconductor island include a point defect of 1 x 10^{16} cm^{-3} or more in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang teaches in column 11, lines 47 - 56 that is obvious to have the hydrogen element for neutralizing the point defect at a concentration of 1 x 10^{18} cm^{-3}.

With regard to claim 77, it is obvious in Zhang wherein said semiconductor island includes the spin density not lower than 1 x10^{15} cm^{-3}.

With regard to claim 78, Zhang discloses in column 4, lines 18 - 20 wherein said semiconductor island is a silicon island.

With regard to claim 79, Zhang discloses in column 9, lines 38 - 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would

have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 80, Zhang discloses in figure 4c a thin film transistor. Zhang discloses in figures la - lc, 2a - 2d, and 4a -4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 4a - 4c a gate insulating film on at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode over said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary. Zhang discloses in column 9, lines 38 - 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches wherein said semiconductor island includes a point defect of 1 x 10^{16} cm^{-3} or more. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to have said semiconductor island include a point defect of 1 x 10^{16} cm^{-3} or more in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in figures 4c and column 11, lines 47 - 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than 1 x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than 1 x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of

ordinary skill in the art to use the hydrogen atom concentration of not higher than 1 x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^{-3} or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claims 81, 88, 94, 100, 106, 112, 124, and 130, Zhang discloses in figures la, lb, and 2a; and column 6, lines 19 - 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 82, 89, 95, 101, 107, 113, 125, and 131, Zhang discloses in figures la, lb, and 2a; and column 6, lines 19 - 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5 x 10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious

to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5 x 10^{19} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 83, Zhang discloses in figures 4c and column11, lines 47 - 56 wherein said semiconductor island includes hydrogen for neutralizing the point defect at a concentration less than 1 x 10^{20} cm^{-3}. It is not clear if Zhang teaches the hydrogen concentration is not lower than 1 x 10^{15} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not lower than 1 x 10^{15} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 84, no differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures la - lc, 2a - 2d and 4a - 4c wherein said semiconductor island includes a spin density of 1 x 10^{15} to l x 10^{17} cm^{-3}, because an identical spin density is a property that must be shared by products that result from two processes that are the same.

With regard to claims 85, 90, 96, 102, 108, 114, 126, and 132, Zhang discloses in column 4, lines 18 - 20 wherein said semiconductor island is a silicon island.

With regard to claim 86, 91, 97, 103, 109, 115, 127, and 133, Zhang discloses in column 9, lines 38 - 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen

at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 87, Zhang discloses in figure 4c a semiconductor device. Zhang discloses in figures la - lc, 2a - 2d, and 4a - 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures la-lc, 2a - 2d, and 4a - 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column11, lines 47 - 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than 1 x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than 1 x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than 1 x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 - 100 cm^2/Vs. Zhang is silent to the fact that the

semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^{-3} or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claim 92, 98, 104, 110, 116, 128, and 134, Zhang teaches in figures la, lb, 2a -2d; and column 12, lines 1 - 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a

grain size of 50 - 100 μm when the metal portions are set from 25 - 50 μm apart as disclosed by Zhang in column 12, lines 1 -30.

With regard to claim 93, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures la - lc, 2a - 2d, and 4a - 4c a crystalline semiconductor island insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures la- lc, 2a -2d, and 4a - 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column 11, lines 47 - 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than 1 x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than 1 x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than 1 x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 - 150 cm2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of

ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^{-3} or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claim 99, Zhang discloses in figure 4c semiconductor device. Zhang discloses in column 9, lines 38 -45 a p-channel thin film transistor. Zhang discloses in column 9, lines 38 - 45 an n-channel thin film transistor. Zhang discloses in figures la - lc, 2a - 2d, and 4a - 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures la- lc, 2a - 2d,

and 4a - 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column 11, lines 47 - 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than 1 x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than 1 x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than 1 x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^{-3} or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claim 105, Zhang discloses in figure 4c semiconductor device. Zhang discloses in column 9, lines 38 -45 a p-channel thin film transistor. Zhang discloses in column 9, lines 38 - 45 an n-channel thin film transistor. Zhang discloses in figures la - lc, 2a - 2d, and 4a - 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures la- lc, 2a- 2d, and 4a -4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang discloses in column 9, lines 38 - 43 wherein the crystalline semiconductor island includes carbon at a concentration less than 1 x 10^{19} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon at a concentration not higher than 5 x 10^{18} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon at a concentration not higher than 5 x 10^{18} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in figures 4c and column 11, lines 47 - 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than 1 x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than 1 x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than 1 x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed

range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^{-3} or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claim 111, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures 8a and 8b; and column 9, lines 28 - 37 an active matrix circuit portion including at least a first thin film transistor. Zhang discloses in column 9, lines 38 - 45 a driving circuit portion including at least a second thin film transistor. Zhang discloses in figures la - lc, 2a - 2d, and 4a - 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures la- lc, 2a- 2d, and 4a - 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline

semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column 11, lines 47 - 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than 1 x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than 1 x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than 1 x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^{-3} or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

With regard to claims 123 and 129, Zhang discloses in figure 4c a semiconductor device. Zhang discloses in figures la - lc, 2a - 2d, and 4a -4c a crystalline semiconductor island on an

insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures la- lc, 2a - 2d, and 4a - 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island (channel forming region) is formed in a monodomain region which contains no grain boundary. Zhang discloses in column 9, lines 38 - 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than $1 \times 10^{18}\ cm^{-3}$. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than $5 \times 10^{18}\ cm^{-3}$. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than $5 \times 10^{18}\ cm^{-3}$ in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures la- lc, 2a- 2d and 4a -4c wherein said semiconductor device has a S value of 0.03-0.3, because an identical S value is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column 11, lines 47 - 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than $1 \times 10^{20}\ cm^{-3}$ (i.e. the known atomic density of Si is $10^{22}\ cm^{-3}$, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than $1 \times 10^{20}\ cm^{-3}$. MPEP 2144.05 states that overlapping

ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than 1 x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 - 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of 30 - 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of

Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang. Further, Zhang does not specifically teach that the island includes a nickel at a concentration of $5x10^{17}$ cm^{-3} or less. However, the claim is prima facie obvious without showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 135-141, 143, and 144, Zhang discloses in col. 9, lines 38-45 each of the concentrations of carbon, nitrogen and oxygen is measured. The limitation "wherein each of the concentration of carbon, nitrogen, and oxygen is measure by secondary ion mass spectroscopy (SIMS)" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966.

Regarding claims 145, 147, 149, 150, 151, and 154, Zhang discloses in column 9, lines 38 - 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}.

Regarding claims 146, 148, 152, 153, and 155, Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 - 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 - 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of 30 - 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain

region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

Response to Arguments

Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is 571-272-1731. The examiner can normally be reached on 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew C. Landau
Primary Examiner
Art Unit 2815
8/30/07